Another start abduction aiming at empirical progress. Reply to Joke Meheus

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ANOTHER START FOR ABDUCTION AIMING AT EMPIRICAL PROGRESS

REPLY TO JOKE MEHEUS

As mentioned already in my reply to Aliseda, Joke Meheus was the second one to take up the challenge that I presented in 1998 and published in 1999, viz. to design a method, a logic or a computer program, for abducing a revised hypothesis that is empirically more successful than a given one. Whereas Aliseda starts from Beth's semantic tableaux method, Meheus starts from Batens' adaptive logic program. In this reply I would like to evaluate the question to what extent the specific logic developed by Joke Meheus meets the challenge. But let me start by stressing that, although her logic is in many respects incomplete, I appreciate it very much, for it seems a very promising start. She shows at least that the Ghentian style of ampliative adaptive logic enables one separately and comparatively to evaluate abductive individual hypotheses. More precisely, given a set of (general) background beliefs and (individual) observations, explanatory hypotheses can be derived by using a set of rules, consisting of the classical rules, amplified with some general and some specific ones, in a stepwise, adaptive way, that is, in the course of a proof, a previously derived conclusion may have to be withdrawn. In fact, it is a two-level construction; the adaptive, first-order, logic itself and a modal proof theory for it. The result is that hypotheses and predictions appear as possibilities in view of the background knowledge and the given observations. Besides the general rules and marking criteria for a general logic for abduction (**LA**), some specific rules and criteria are needed to get a specific logic for empirical progress ($\mathbf{LA}^{\mathbf{k}}$), abducing the maximally successful hypothesis, if any.

If I see it correctly, $\mathbf{LA}^{\mathbf{k}}$ still has some severe restrictions, which might be withdrawn later. To begin with, as Meheus remarks herself, it is essentially restricted to hypotheses explaining surprising or novel events, that is, events that are not only not entailed by the background knowledge but also compatible with it. Moreover, it seems to be restricted to singular explanatory hypotheses. Last but not least, it essentially deals with the evaluation of explanatory hypotheses, not with their generation. In the rest of this reply, I first deal with the restriction

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to singular hypotheses explaining surprising events, before turning to the generation issue.

Singular Hypotheses Explaining Novel Events

Let me start by noting that given the restriction to novel events, an explanatory hypothesis may be seen as a candidate for empirical progress relative to the background beliefs alone. The "old" hypothesis, to be replaced by a "new" one, may just be the tautology. However, as becomes clear from the final example (1)-(17), with (3) replaced by (3′), the method may also first lead to a hypothesis (11) that is later replaced by a better one (16). Hence, both separate and comparative evaluation is covered by the method. This seems to suggest how to proceed with anomalous observations, that is, observations in conflict with the background beliefs, at least as soon as the conflicting background beliefs can be shown to be a proper subset. In that case, the natural question is whether the conjunctive hypothesis of these beliefs can first be derived in $\mathbf{LA}^{\mathbf{k}}$, possibly with using older observations, and then be replaced by a better one.

Let us now turn to the apparent restriction to singular hypotheses. If I see it correctly, hypotheses can only come in the game by RC in **LA** and, in addition, by RC^{k} in $\mathbf{LA}^{\mathbf{k}}$. The question is whether, in both cases, the modally hypothesized A can be of the same conditional logical form as (the non-modal versions of) the background beliefs are apparently assumed to have. This form is essential for general explanatory hypotheses. In its simplest form, the question is whether $\mathbf{LA}^{(\mathbf{k})}$ can deal with (conditional) inductive generalizations. Be this as it may, my impression is that, if not, it will not be too difficult to adapt the method for this purpose. In both cases, a toy example might be very helpful.

There remains the question of the generalization of the method to the general instrumentalist abduction task, that is, the generation and evaluation of theory revision in the face of remaining counterexamples. For the evaluative side I should like to refer to my reply to Aliseda, whose method is in a similar position in this respect. However, regarding the generation side, the situation seems to be different.

Generation

As Aliseda (1997) has pointed out, abduction in the sense of Peirce essentially covers the generation and evaluation of explanatory hypotheses. However, $\mathbf{LA}^{(\mathbf{k})}$ does not generate a hypothesis, but evaluates it, in the sense that there may be routes of reasoning such that the hypothesis may be (conditionally) derived

and not yet have to be withdrawn. The crucial rule $RC^{(k)}$ presupposes that one introduces the formula '*A*' oneself. Hence, the question is whether there is such a construction method for one or more of such hypotheses. In this respect, the tableau method of Aliseda and the one suggested by Urbanski (2001) seem to have an advantage. However, I do not want to rule out that Meheus might give her method a constructive turn. To be sure, a decent method to prove that a certain hypothesis may be abduced as the most successful one, relative to the background beliefs and the available evidence, of those that have been considered so far, is of independent, substantial value.

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